PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-090782

(43)Date of publication of application : 27.03.2002

(51)Int.Cl. G02F 1/167
G02F 1/133
G02F 1/1334
G02F 1/1335
G09F 9/30
G09F 9/37

(21)Application number : 2000-277372

(22)Date of filing : 12.09.2000

(71)Applicant : CANON INC

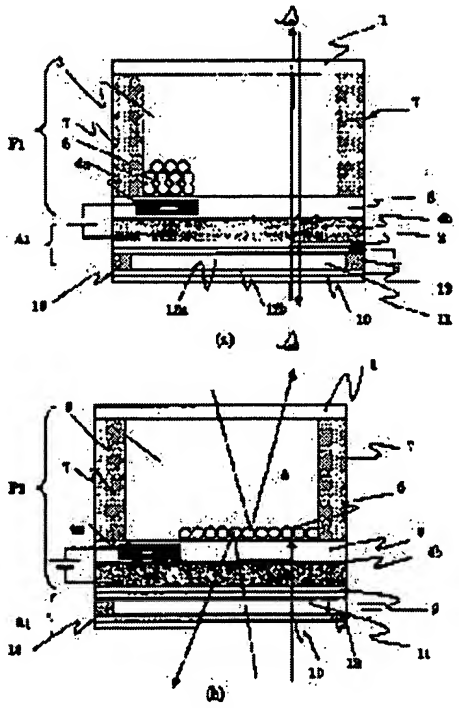
(72)Inventor : OGAWA AKIKO

(54) DISPLAY DEVICE AND METHOD FOR DRIVING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To enable to select between a transmission type display and a reflection type display.

SOLUTION: Light is switched for every pixel to display a picture in a display part P1, and a transmission/scattering layer part A1 is set in a light transmission state or a light reflection state according to surrounding brightness. Thereby, the transmission type display or the reflection type display can be selected.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the

examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] The display with which the modulated light component which can appear a light transmission condition and a light reflex condition alternatively is characterized by what has been arranged so that said display device may be met in the display equipped with the transparency mold display device which switches light.

[Claim 2] Said transparency mold display device is the transparence substrate of the pair arranged at the condition of having opened the predetermined gap, the switching layer which is arranged among these transparence substrates and switches light, the electrode arranged so that this switching layer may be met, and a display according to claim 1 characterized by what was constituted as be alike.

[Claim 3] Said switching layer is a display according to claim 2 characterized by what is made for the insulating liquid of light transmission nature to distribute a coloring charged particle.

[Claim 4] Said switching layer is a display according to claim 2 characterized by what is been liquid crystal.

[Claim 5] Said switching layer is a display according to claim 2 characterized by what is been the polymer dispersed liquid crystal which is the mixture of polymeric materials and liquid crystal.

[Claim 6] Said modulated light component is a display given in claim 1 characterized by what was constituted as resemble the transparence substrate of the pair arranged at the condition of having opened the predetermined gap, the modulated light layer which is arranged among these transparence substrates and performs transparency and reflection of light alternatively, and the electrode arranged so that this modulated light layer may be met thru/or any 1 term of 5.
[Claim 7] Said modulated light layer is a display according to claim 6 characterized by what is made for the insulating liquid of light transmission nature to distribute a coloring charged particle.
[Claim 8] Said modulated light layer is a display according to claim 6 characterized by what is been liquid crystal.
[Claim 9] Said modulated light layer is a display according to claim 6 characterized by what is been the polymer dispersed liquid crystal which is the mixture of polymeric materials and liquid crystal.
[Claim 10] Said transparency mold display device is a display given in claim 1 characterized by what has been arranged at every one both sides of said modulated light component thru/or any 1 term of 9.
[Claim 11] A display given in claim 1 characterized by what appearance of the light transmission condition by said modulated light component and a light reflex condition is performed for about said a part of display device thru/or any 1 term of 10.
[Claim 12] The transparency mold display device which switches light, and the modulated light component which is arranged so that this display device may be met, and can appear a light transmission condition and a light reflex condition alternatively, When it is the drive approach of preparation ********** and said modulated light component is made into a light transmission condition The drive approach of the display characterized by what image display is performed for using the light irradiated by said display device when said transparency mold display device performs image display using the light which penetrates this modulated light component and said modulated light component is made into a

light reflex condition.

[Claim 13] The drive approach of the display according to claim 12 characterized by what a light transmission condition is appeared for based on changing said both display devices into a light transmission condition in said modulated light component list.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the drive approach of the display in which a light transmission mold display and a light reflex mold display are possible, and this display.

[0002]

[Description of the Prior Art] Conventionally, the transparency mold display which performs image display as a display using the transmitted light, and the reflective mold display which performs image display using the reflected light are used.

[0003] among these, as a transparency mold display, for example like the liquid crystal device currently indicated by the No. [02529814] patent official report

The glass substrate of the pair which formed the orientation film and a transparent electrode, respectively is arranged in the condition of having opened the predetermined gap, liquid crystal is arranged among those glass substrates, a polarizing plate and the light source are arranged further, and what displays by changing the luminous intensity which penetrates the inside of liquid crystal is known well.

[0004] On the other hand, as a reflective mold display, the liquid crystal panel (refer to a No. [2921356] patent official report, a No. [2998075] patent official report, and JP,6-337421,A) of the reflective mold which has a reflecting layer, and the electrophoresis display (refer to United States patent USP3612758 official report, JP,9-185087,A, JP,9-211499,A, and JP,6-52358,B) invented by Harold D.Lees etc. are known.

[0005]

[Problem(s) to be Solved by the Invention] By the way, in the case of an above-mentioned transparency mold indicating equipment, there was a problem that the part power consumption which needs back light equipment will increase.

[0006] Moreover, the display mentioned above was influenced of the strength of outdoor daylight, and in the location where outdoor daylight is strong in the case of a transparency mold display, image display stopped being able to be visible easily due to reflection of outdoor daylight, and when it was a reflective mold display, it had the problem that image display stopped being able to be visible easily in the location where outdoor daylight is weak.

[0007] Furthermore, although the above indicating equipments are arranged in various parts according to the application, the needs arranged to window parts, such as vehicles (for example, an electric car, a bus, etc.) and buildings (for example, store etc.), are also considered. In this case, when light was not penetrated only by image display being presented with a display, an external scene stops having been in sight from the interior, the light from the outside did not go into the interior (it is got blocked and is in that the function of window part original is spoiled ****), and there was a problem. For example, since there is a

reflecting plate which does not make light penetrate in the case of a reflective mold display, such a problem arises, and when it was a transparency mold display, the display device itself, such as a liquid crystal panel, was producing such a problem, in order that back light equipment etc. might interrupt light, although it is a light transmission mold.

[0008] Then, this invention aims at offering the display which prevents the increment in power consumption.

[0009] Moreover, this invention aims at offering the display which prevents quality degradation of image display.

[0010]

[Means for Solving the Problem] This invention is made in consideration of the above-mentioned situation, and the modulated light component which can appear a light transmission condition and a light reflex condition alternatively is characterized by what has been arranged so that said display device may be met in the display equipped with the transparency mold display device which switches light.

[0011] Moreover, the transparency mold display device to which this invention switches light and the modulated light component which is arranged so that this display device may be met, and can appear a light transmission condition and a light reflex condition alternatively, When it is the drive approach of preparation ********** and said modulated light component is made into a light transmission condition When said transparency mold display device performs image display using the light which penetrates this modulated light component and said modulated light component is made into a light reflex condition, it is characterized by what image display is performed for using the light irradiated by said display device.

[0012]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to drawing 1 thru/or drawing 4 .

[0013] The indicating equipment concerning the gestalt of this operation is

constituted as resemble the transparency mold display device P1 which switches light to drawing 1 as a sign D1 shows, and the modulated light component A1 which is arranged so that this display device P1 may be met, and can appear a light transmission condition and a light reflex condition alternatively.

[0014] What is necessary is just to make it said transparency mold display device P1 have two or more pixels here, although drawing 1 shows the cross-section structure of one pixel. And it is [that what is necessary is just to display an image] good by performing independently switching of the light by said transparency mold display device P1 per pixel to be made to perform appearance of the light transmission condition by said modulated light component A1, or a light reflex condition similarly to two or more pixels. That is, when it is made for light to be irradiated like two or more pixels of a display device P1 when said modulated light component A1 is made into a light transmission condition (refer to drawing 1 (a)), and said modulated light component A1 is made into a light reflex condition (refer to drawing 2 (a)), it is good for the light which has penetrated two or more pixels of a display device P1 to be made to be reflected similarly. In addition, about pixel, a part of [a part of display device a part of / i.e., / which are each pixel /,], appearance of the light transmission condition by said modulated light component A1 or a light reflex condition is performed, although it may be made to carry out by covering the whole surface mostly (refer to drawing 3 (a) (b)) (refer to drawing 4), and it is good even if like.

[0015] and when said modulated light component A1 is made into a light transmission condition When image display is performed (refer to drawing 1 (a) (b)) and said modulated light component A1 is made into a light reflex condition by said transparency mold display device P1 using the light which penetrates this modulated light component A1 Image display is performed using the light irradiated by said display device P1 (refer to drawing 2 (a) (b)). Moreover, although image display is not made based on changing both display devices P1 into a light transmission condition at modulated light component A1 list, a light

transmission condition can be appeared (refer to drawing 1 (a)).
[0016] Here, the transparency mold display device P1 is constituted as resemble the transparence substrates 1 and 2 of the pair arranged at the condition of having opened the predetermined gap, the switching layer 3 which is arranged among these transparence substrates 1 and 2, and switches light, and the electrodes 4a and 4b arranged so that this switching layer 3 may be met. In drawing 1 and drawing 2 , in addition, as a switching layer 3 What distributed the coloring charged particle 6 is shown in the insulating liquid 5 of light transmission nature (). namely, the example which used the display device as the electrophoresis component -- being shown -- liquid crystal, such as a guest-host mold and a twist nematic (TN) mold, -- you may use () that is, it is good even if it uses the polymer dispersed liquid crystal which is the mixture of polymeric materials and liquid crystal well also as a liquid crystal device about a display device (namely, a display device -- as a polymer dispersed liquid crystal component). What is necessary is to be good to use a reflective mold liquid crystal device which is indicated by the transparency mold liquid crystal device, No. [2921356] patent official report and No. [2998075] patent official report which are indicated by the No. [2529184] patent official report, and JP,6-337421,A as a liquid crystal device, and just to use what is indicated by JP,8-179704,A (Fujikura) and JP,9-211499,A (Toshiba) as an electrophoresis component.
[0017] Moreover, the modulated light component A1 is constituted as resemble the transparence substrates 2 and 10 of the pair arranged at the condition of having opened the predetermined gap, the modulated light layer 11 which is arranged among these transparence substrates 2 and 10, and performs transparency and reflection of light alternatively, and the electrodes 12a and 12b arranged so that this modulated light layer 11 may be met. Here, as a modulated light layer 11, liquid crystal may be used like the switching layer 3 (). That is, the polymer dispersed liquid crystal which is the mixture of polymeric materials and liquid crystal well also as a transparency mold liquid crystal device about a

modulated light component may be used (). that is, it is good also as a thing which made the insulating liquid of light transmission nature distribute a coloring charged particle for a modulated light component well also as a polymer dispersed liquid crystal component (namely, a modulated light component -- as an electrophoresis component). In addition, a nematic liquid crystal, a smectic liquid crystal, cholesteric liquid crystal, etc. can also use any, without being limited as liquid crystal, especially if it is the liquid crystal ingredient which can change the display by just carrying out the value of difference deltaepsilon of a dielectric constant perpendicular to a dielectric constant parallel to an orientation vector from negative [forward to / negative or negative] by impressing an electrical potential difference although giant-molecule distributed process input output equipment is common. 10% or less of permeability is desirable in the state of dispersion 80% or more in the state of transparence.

[0018] In addition, in drawing 1 , although the modulated light component A1 is arranged to the exterior (namely, under the electrode shown by sign 4b) of the transparency mold display device P1, of course, it is not restricted to this and may be arranged inside the transparency mold display device P1 (for example, between Electrodes 4a and 4b). Moreover, in this drawing, although the transparence substrate shown with a sign 2 is making the component part of both a display device P1 and the modulated light component A1 serve a double purpose, of course, it is not restricted to this and a separate transparence substrate may be used.

[0019] By the way, by drawing 1 , only one transparency mold display device P1 mentioned above is arranged so that the modulated light component A1 may be met, but as shown in drawing 3 and drawing 4 , it may be arranged on every one both sides of the modulated light components A1 and A2.

[0020] Next, effectiveness is explained to the operation (drive approach of display) list of the gestalt of this operation.

[0021] When the modulated light component A1 is now made into a light reflex condition, a display device P1 can perform image display of a light reflex mold

(refer to drawing 2 (a) (b)), and when the modulated light component A1 is made into a light transmission condition, a display device P1 can perform image display of a light transmission mold (refer to drawing 1 (a) (b)). In addition, that what is necessary is just to determine after measuring the quantity of light of the front flesh side of an indicating equipment D1, in any case, whether which image display of a light reflex mold and a light transmission mold is performed can make back light equipment unnecessary, and it can reduce power consumption. And in the location where outdoor daylight is strong, image display can be made clear irrespective of the strength of outdoor daylight by displaying a light reflex mold and displaying a light transmission mold in the location where outdoor daylight is weak.

[0022] Moreover, when both the modulated light component A1 and the display device P1 are made into a light transmission condition, the background of (drawing 1 (a) reference) and a display D1 can be checked by looking. therefore, when the installation part of this indicating equipment is used as window parts, such as vehicles (for example, an electric car, a bus, etc.) and buildings (for example, store etc.), image display can be performed by easy actuation even if it does not remove the indicating equipment itself -- if needed, or the function of window part original can be regained, and internal and external visibility can be secured (the lighting nature inside for example, the interior of a vehicle or a building is secured). In addition, when the light source inside a vehicle or a building is used, image display of a light transmission mold can be performed to those exteriors.

[0023] Furthermore, as shown in drawing 3 , when a display device P1 is formed in the both sides of the modulated light component A1, respectively, the double-sided display using those display devices P1 can be performed independently.

[0024] Furthermore, as shown in drawing 4 , when appearance of the light transmission condition by said modulated light component A1 and a light reflex condition is made to be performed about said a part of display device P1, both reservation (reservation of the internal and external visibility of a vehicle or a

building) of image display and visibility can be attained to coincidence.

[0025]

[Example] Hereafter, in accordance with an example, this invention is further explained to a detail.

[0026] (Example 1) In this example, it produced by the approach of showing the display D1 shown in drawing 1 in drawing 5 .

[0027] That is, the titanium carbide film was formed to PET film 8a of 100-micrometer thickness as an insulating layer, patterning of this film was carried out to the shape of Rhine by photolithography and dry etching, and electrode 4a was formed (refer to drawing 5 (a)). In addition, line breadth of electrode 4a was set to 50 micrometers. Next, transparence polyimide layer 8b as an insulating layer was formed (refer to this drawing (b)), ITO (indium Tin oxide) was formed in the rear face (inferior surface of tongue shown in drawing) of PET film 8a, patterning was carried out to the shape of Rhine, and electrode 4b was formed so that this electrode 4a might be covered (refer to this drawing (c)).

[0028] And the septum 7 whose height is 50 micrometers was formed with the optical photopolymer (refer to this drawing (d)), the adhesives of light transmission nature were applied to the top face of this septum 7, and the substrate 1 was pasted up on the top face of transparence polyimide layer 8b. And Isopar H(exon company make) 5 as an insulating liquid and the coloring charged particle 6 were poured into the interior of a septum 7 (refer to this drawing (e)). In addition, as a coloring charged particle 6, it is polystyrene and the mixed particle of carbon and the thing with a magnitude of about 1-3 micrometers was used.

[0029] Next, transparency/dispersion section (modulated light component) A1 was produced by the approach indicated by JP,05-061023,A. Namely, the transparence substrates 2 and 10 of the pair in which the ITO transparent electrodes 12a and 12b and insulating layers 14a and 14b were formed so that it may **** to drawing 6 A spacer 13 is put. About the cel gap of 10 micrometers Lamination, A predetermined mixed solution (namely, mixed solution of the 2-

ethylhexyl acrylate of a polymerization nature monomer, polymerization nature oligomer PE 9000 (product made from Neagari Industry) and dual tone multifrequency drive liquid crystal NR-1012XX (Chisso Corp. make), and a polymerization initiator benzophenone) is poured into the substrate gap. This mixed solution was made into the transparency / scattering layer 11 (modulated light layer) which is stiffened by UV irradiation and consists of a liquid crystal macromolecule compound layer.

[0030] And lamination and a display D1 were produced for the display P1, and the transparency / scattering layer section A1 produced as mentioned above by the resin of light transmission nature.

[0031] After making transparency / scattering layer 11 into a dispersion condition now, if the electrical potential difference of -50V is impressed to electrode 4a, it will be drawn to this electrode 4a by the coloring charged particle 6 charged in straight polarity, and an assembly (refer to drawing 2 (a)) and an observer will check the color (white) of transparency / scattering layer 11 by looking. Even if it stopped the electrical-potential-difference impression to Electrodes 4a and 4b in this condition, the white display condition was maintained. Moreover, when the electrical potential difference of -50V is impressed to electrode 4b, it will be drawn to electrode 4b by the coloring charged particle 6 charged in straight polarity, and an assembly (refer to drawing 2 (b)) and an observer will check the color of the coloring charged particle 6 by looking. The speed of response in this case is 30 or less msecs, and display nonuniformity was not observed.

[0032] Next, in order that the coloring charged particles 6 charged in straight polarity may draw and gather for this electrode 4a if the electrical potential difference of -50V is impressed to electrode 4a after making transparency / scattering layer 11 into a transparence condition (refer to drawing 1 (a)), an observer will check by looking the scene which penetrated the display D1.

[0033] (Example 2) In this example, silicone oil was used as an insulating liquid 5, and polyethylene, yellow, cyanogen, and a coloring particle with a particle size of 1-2 micrometers which consists of a color pigment of MAZENDA were used as a

coloring charged particle 6. Moreover, hardening of the mixed solution at the time of producing transparency / scattering layer section A1 was performed by using UV irradiation and heating together. The other configurations and manufacture approaches were made the same as an example 1.

[0034] After making transparency / scattering layer 11 into a dispersion condition now, when the electrical potential difference of -50V is impressed to electrode 4a, it is drawn to this electrode 4a by the coloring charged particle 6 charged in straight polarity, and an assembly (refer to drawing 2 (a)) and an observer will check by looking the light reflected by transparency / scattering layer 11, and will recognize a white display. Even if it stopped the electrical-potential-difference impression to Electrodes 4a and 4b in this condition, the white display condition was maintained. Moreover, when the electrical potential difference of -50V is impressed to electrode 4b, it will be drawn to electrode 4b by the coloring charged particle 6 charged in straight polarity, and an assembly (refer to drawing 2 (b)) and an observer will check by looking the light reflected by the coloring charged particle 6. The speed of response in this case is 30 or less msecs, and display nonuniformity was not observed.

[0035] Next, when the electrical-potential-difference impression to transparency / scattering layer 11 is stopped, a display D1 will be in a transparence condition over the whole surface, and an observer will check by looking the scene which penetrated the display D1.

[0036] (Example 3) In this example, the double-sided display D2 shown in drawing 3 was produced. With light transmission nature adhesives, this display D2 made the display (transparency mold display device) P1 of a pair rival on the front reverse side of transparency / scattering layer section (modulated light component) A1, and was produced on it. In addition, the same thing was used for transparency / scattering layer section A1 with having produced in the example 2 at the display P1 using the thing same with having produced in the example 1.

[0037] When each display P1 was driven in the condition of having made transparency / scattering layer 11 becoming cloudy now, image display was able

to be checked by looking in both sides (refer to drawing 3 (a)).
[0038] Moreover, while impressing the electrical potential difference of 50V to the electrode of transparency / scattering layer 11 and changing into a transparency condition, it is drawing 1 (a) about the drive of a display P1. When it is made to be shown, it is drawing 3 (b). Light penetrates a display so that it may be shown.
[0039] (Example 4) In this example, the display D4 shown in drawing 7 was produced. That is, the same thing was used for transparency / scattering layer section (modulated light component) A1 with having produced in the example 2, using the reflective mold liquid crystal display component currently indicated by JP,06-337421,A as a display P2. And the transparency reflective mold compound-die display D4 to which these displays P2, and the transparency / scattering layer section A1 are made as for both a transparency mold display and a reflective mold display by pasting up with light transmission nature adhesives was produced.
[0040] Liquid crystal matter, such as a guest-host mold, was ****(ed) with the glass plate which specifically has the transparent electrode which carried out the orientation membrane process in an electrode surface, and the liquid crystal display component which equipped the screen with the polarizing plate was used as a display P2. Moreover, to the front-face [of a display], and rear-face side, the component (un-illustrating) which can detect the quantity of light has been arranged, respectively.
[0041] Thus, about the produced display, it is drawing 7 (a). And (b) The windowpane 20 of a building was pasted so that it might be shown, and it displayed by driving a display P2 by 1480 duty.
[0042] When the amount L2 of transmitted lights was measured by making transparency / scattering layer section A1 into a transparence condition, it turned out that it becomes about 3 - 40 percent of the outdoor light L1, and when bright in the outdoors, it has checked in daytime that the image display by the display was possible as a back light using the light (natural light) L2 from the outdoors (refer to drawing 7 (a)).

[0043] In addition, image display can be performed by using a display as a reflective mold at night etc. by making transparency / scattering layer section A1 into a dispersion condition, in are dark in the outdoors and being bright in indoor (refer to drawing 7 (b)).

[0044] Moreover, as shown in drawing 8 , when transparency / scattering layer section A1 was made into a transparence condition and image display was performed by the display P2, the image display by using the indoor illumination light (transmitted light) L3 was possible.

[0045] (Example 5) In this example, as shown in drawing 4 , the almost same double-sided display D3 as an example 3 was produced. However, in transparency / scattering layer section (modulated light component) A2, an ITO transparent electrode (refer to sign 12a of drawing 6 and 12b) carries out chisel formation partially, and appeared the nebula condition partially. The other configurations and manufacture approaches were made the same as an example 3.

[0046] When each display P1 was driven in the condition of having made transparency / scattering layer 11 becoming cloudy now, in the part which this became cloudy, image display could be checked by looking in both sides, and the transparence condition has been appeared except the part which became cloudy (refer to drawing 4).

[0047] Moreover, when transparency / scattering layer A2 was changed into the transparency condition, the transparency condition has been appeared in the whole display P2.

[0048]

[Effect of the Invention] As explained above, when a modulated light component is made into a light reflex condition according to this invention, a display device can perform image display of a light reflex mold, and when a modulated light component is made into a light transmission condition, a display device can perform image display of a light transmission mold. Power consumption can be reduced being able to use back light equipment as unnecessary in any case. And

in the location where outdoor daylight is strong, image display can be made clear irrespective of the strength of outdoor daylight by displaying a light reflex mold and displaying a light transmission mold in the location where outdoor daylight is weak.

[0049] Moreover, the background of a display can be checked by looking when both a modulated light component and a display device are made into a light transmission condition. therefore, when the installation part of this indicating equipment is used as window parts, such as vehicles (for example, an electric car, a bus, etc.) and buildings (for example, store etc.), image display can be performed by easy actuation even if it does not remove the indicating equipment itself -- if needed, or the function of window part original can be regained, and internal and external visibility can be secured (the lighting nature inside for example, the interior of a vehicle or a building is secured). In addition, when the light source inside a vehicle or a building is used, image display of a light transmission mold can be performed to those exteriors.

[0050] Furthermore, when a display device is prepared in the both sides of a modulated light component, respectively, the double-sided display using those display devices can be performed independently.

[0051] Furthermore, when appearance of the light transmission condition by said modulated light component and a light reflex condition is made to be performed about said a part of display device, both reservation (reservation of the internal and external visibility of a vehicle or a building) of image display and visibility can be attained to coincidence.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Drawing in which being the sectional view showing an example (1-pixel part) of the structure of the display concerning this invention, and showing a situation in case a modulated light component is in a light transmission condition.

[Drawing 2] Drawing in which being the sectional view showing an example (1-pixel part) of the structure of the display concerning this invention, and showing a situation in case a modulated light component is in a light reflex condition.

[Drawing 3] The sectional view showing an example (1-pixel part) of the structure of the display concerning this invention.

[Drawing 4] The sectional view showing an example (1-pixel part) of the structure of the display concerning this invention.

[Drawing 5] Drawing showing the manufacture approach of a display device.

[Drawing 6] Drawing showing the detail structure of transparency/dispersion section.

[Drawing 7] The sectional view showing an example of the structure of the display concerning this invention.

[Drawing 8] The sectional view showing an example of the structure of the display concerning this invention.

[Description of Notations]

1 Transparence Substrate

2 Transparence Substrate

3 Switching Layer

4a, 4b Electrode

5 Silicone Oil (Insulating Liquid)

6 Coloring Charged Particle

10 Transparence Substrate

11 Transparency/Scattering Layer (Modulated Light Layer)

12a, 12b Electrode

A1 Transparency / scattering layer section (modulated light component)

D1 Display

D2 Display

D3 Display

D4 Display

P1 Display (transparency mold display device)

P2 Display (transparency mold display device)

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

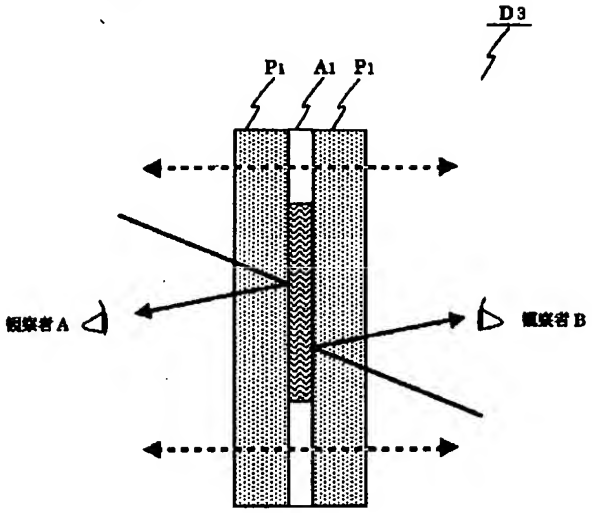
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

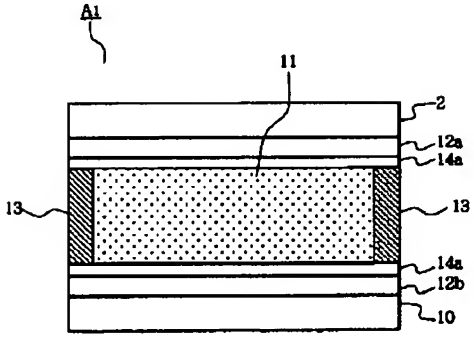
3.In the drawings, any words are not translated.

DRAWINGS

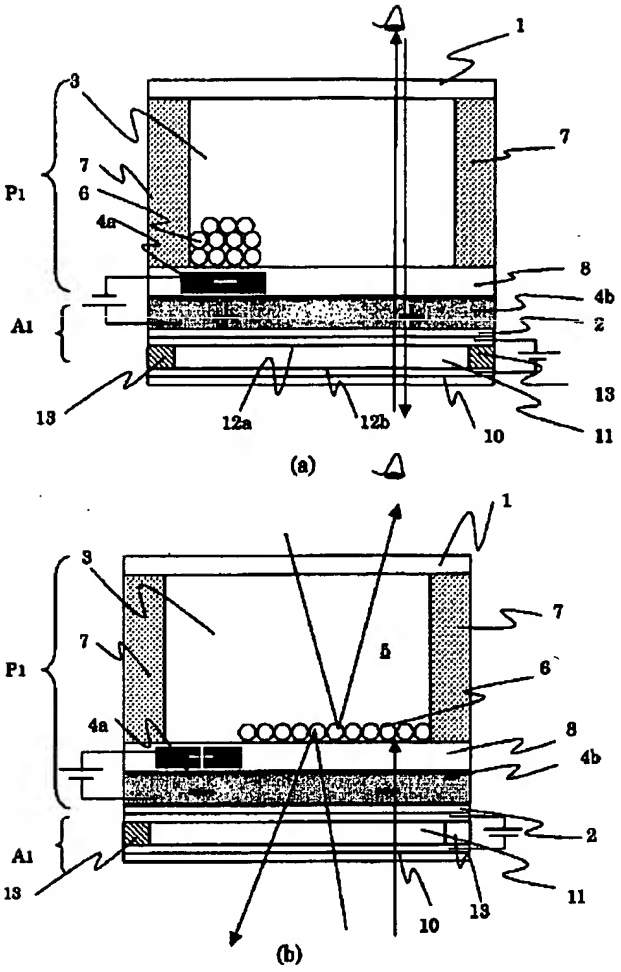
[Drawing 4]



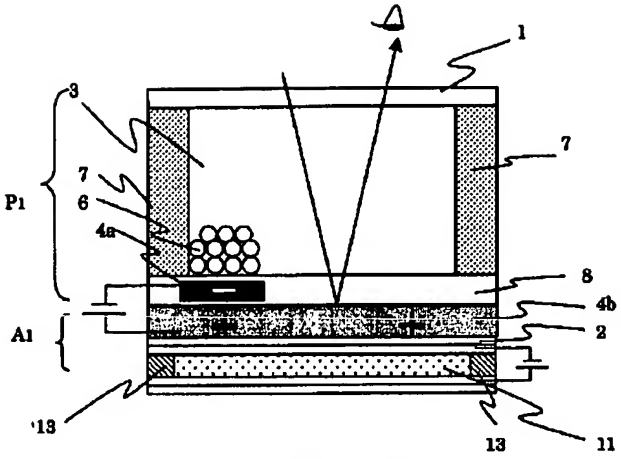
[Drawing 6]



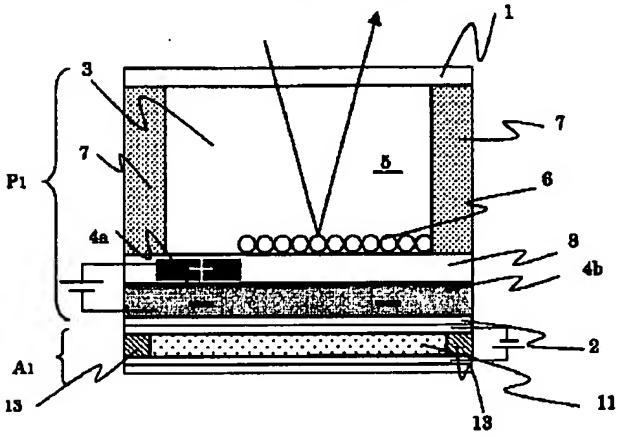
[Drawing 1]


1
3
7
P1
7
6
4a
8
4b
A1
2
13
13
12a
12b
10
11
(a)
1
3
7
7
5
P1
6
4a
8
4b
2
A1
13
11
10
13
(b)

[Drawing 2]

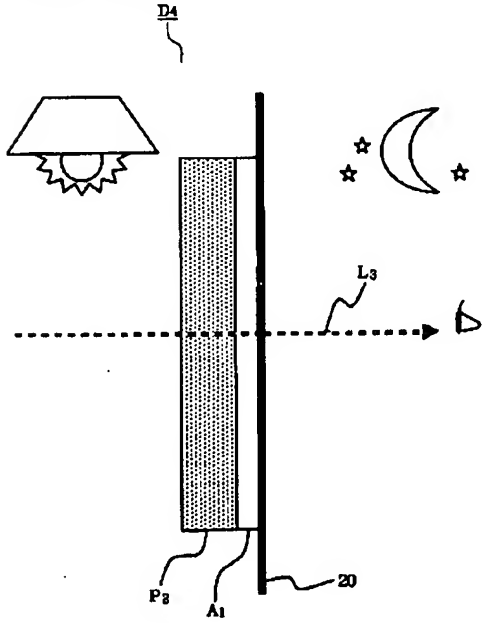

1
3
7
P1
7
6
4a
8
4b
A1
2
13
13
11

(a)

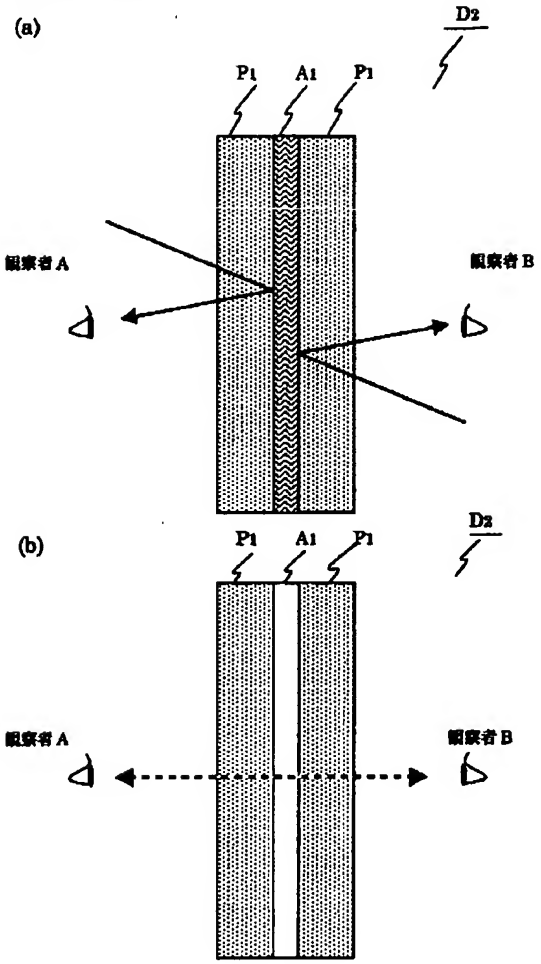

1
3
7
P1
7
5
6
4a
8
4b
2
A1
13
13
11

(b)

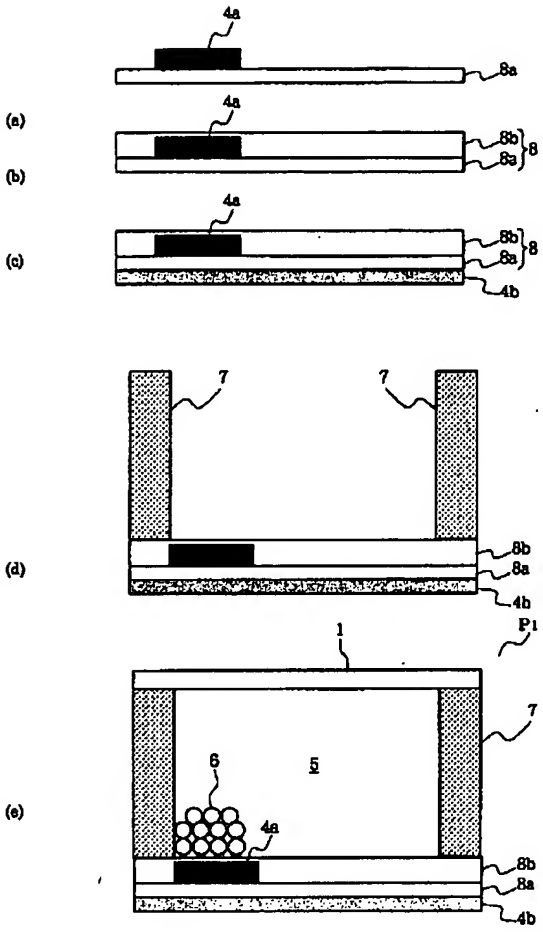
[Drawing 8]


D4
L3
P3
A1
20

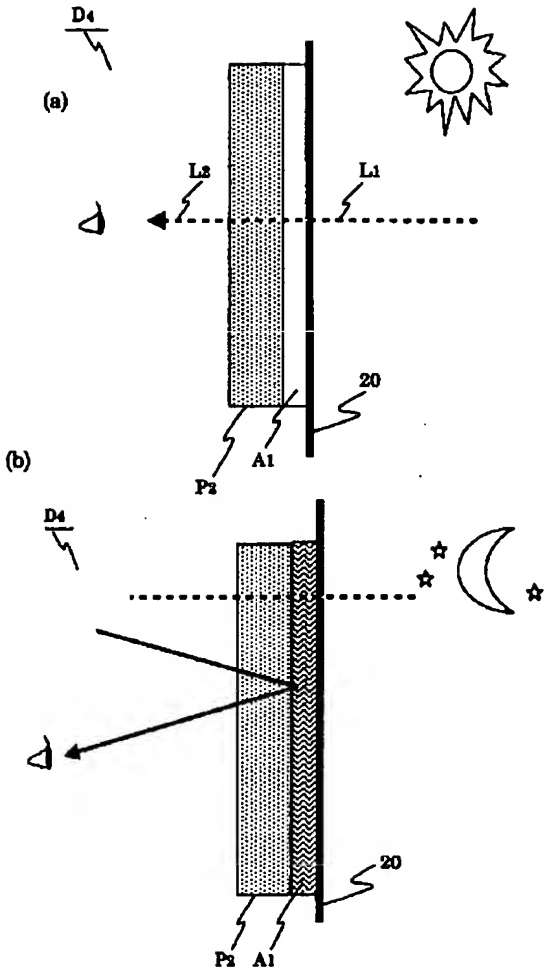
[Drawing 3]



[Drawing 5]



[Drawing 7]



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号
特開2002－90782
（P2002－90782A）
(43)公開日　平成14年３月27日(2002.3.27)

(51)Int.Cl.[7]		識別記号	FI			ﾃｰﾏｺｰﾄﾞ(参考)
Ｇ０２Ｆ	1/167		Ｃ０２Ｆ	1/167		２Ｈ０８９
	1/133	５８０		1/133	５８０	２Ｈ０９１
	1/1334			1/1334		２Ｈ０９３
	1/1335	５２０		1/1335	５２０	５Ｃ０９４
Ｇ０９Ｆ	9/30	３４９	Ｃ０９Ｆ	9/30	３４９Ｚ	

審査請求　未請求　請求項の数13　ＯＬ　（全 ９ 頁）　最終頁に続く

(21)出願番号　特願2000－277372(P2000－277372)

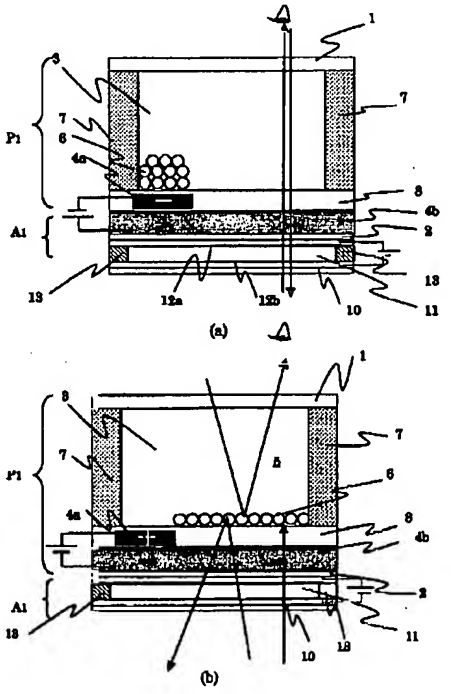
(22)出願日　平成12年９月12日(2000.9.12)

(71)出願人　000001007
キヤノン株式会社
東京都大田区下丸子３丁目30番２号
(72)発明者　小川　晶子
東京都大田区下丸子３丁目30番２号　キヤノン株式会社内
(74)代理人　100082337
弁理士　近島　一夫　（外１名）

最終頁に続く

(54)【発明の名称】　表示装置、及び該表示装置の駆動方法

(57)【要約】
【課題】　透過型及び反射型の表示を選択できるようにする。
【解決手段】　表示部P_1では、各画素毎に光のスイッチングを行って画像表示を行うようにし、透過／散乱層部A_1では、周囲の明るさに応じて、光透過状態又は光反射状態になるようにする。これにより、透過型及び反射型の表示を選択できる。



【特許請求の範囲】
【請求項１】　光のスイッチングを行う透過型表示素子、を備えた表示装置において、
光透過状態と光反射状態とを選択的に現出できる調光素子が、前記表示素子に沿うように配置された、
ことを特徴とする表示装置。
【請求項２】　前記透過型表示素子は、所定間隙を開けた状態に配置された一対の透明基板と、これらの透明基板の間に配置されて光のスイッチングを行うスイッチング層と、該スイッチング層に沿うように配置された電極と、によって構成された、
ことを特徴とする請求項１に記載の表示装置。
【請求項３】　前記スイッチング層は、光透過性の絶縁性液体に着色帯電粒子を分散させたものである、
ことを特徴とする請求項２に記載の表示装置。
【請求項４】　前記スイッチング層は液晶である、
ことを特徴とする請求項２に記載の表示装置。
【請求項５】　前記スイッチング層は、高分子材料と液晶との混合物である高分子分散型液晶である、
ことを特徴とする請求項２に記載の表示装置。
【請求項６】　前記調光素子は、所定間隙を開けた状態に配置された一対の透明基板と、これらの透明基板の間に配置されて光の透過及び反射を選択的に行う調光層と、該調光層に沿うように配置された電極と、によって構成された、
ことを特徴とする請求項１乃至５のいずれか１項に記載の表示装置。
【請求項７】　前記調光層は、光透過性の絶縁性液体に着色帯電粒子を分散させたものである、
ことを特徴とする請求項６に記載の表示装置。
【請求項８】　前記調光層は液晶である、
ことを特徴とする請求項６に記載の表示装置。
【請求項９】　前記調光層は、高分子材料と液晶との混合物である高分子分散型液晶である、
ことを特徴とする請求項６に記載の表示装置。
【請求項１０】　前記透過型表示素子は、前記調光素子の両側に１つずつ配置された、
ことを特徴とする請求項１乃至９のいずれか１項に記載の表示装置。
【請求項１１】　前記調光素子による光透過状態及び光反射状態の現出を、前記表示素子の一部について行う、
ことを特徴とする請求項１乃至１０のいずれか１項に記載の表示装置。
【請求項１２】　光のスイッチングを行う透過型表示素子と、該表示素子に沿うように配置されて光透過状態と光反射状態とを選択的に現出できる調光素子と、を備えた表示装置の駆動方法であって、
前記調光素子を光透過状態とした場合に、該調光素子を透過してくる光を利用して前記透過型表示素子によって画像表示を行ない、かつ、前記調光素子を光反射状態とした場合に、前記表示素子に照射される光を利用して画像表示を行う、
ことを特徴とする表示装置の駆動方法。
【請求項１３】　前記調光素子並びに前記表示素子の両方を光透過状態にすることに基づき、光透過状態を現出する、
ことを特徴とする請求項１２に記載の表示装置の駆動方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、光透過型表示及び光反射型表示が可能な表示装置、及び該表示装置の駆動方法に関する。
【０００２】
【従来の技術】従来、表示装置としては、透過光を利用して画像表示を行う透過型表示装置や、反射光を利用して画像表示を行う反射型表示装置が用いられている。
【０００３】このうち、透過型表示装置としては、例えば、第０２５２９８１４号特許公報に開示されている液晶素子のように、配向膜や透明電極をそれぞれ形成した一対のガラス基板を所定間隙を開けた状態に配置し、それらのガラス基板の間には液晶を配置し、さらに偏光板や光源を配置して、液晶中を透過する光の強度を変化させることによって表示を行うものがよく知られている。
【０００４】これに対して、反射型表示装置としては、反射層を有する反射型の液晶パネル（第２９２１３５６号特許公報や第２９９８０７５号特許公報や特開平６－３３７４２１号公報参照）や、Harold D. Lees等により発明された電気泳動表示装置（米国特許USP３６１２７５８公報や特開平９－１８５０８７号公報や特開平９－２１１４９９号公報や特公平６－５２３５８号公報参照）が知られている。
【０００５】
【発明が解決しようとする課題】ところで、上述の透過型表示装置の場合、バックライト装置を必要とする分消費電力が増えてしまうという問題があった。
【０００６】また、上述した表示装置は外光の強弱の影響を受け、透過型表示装置の場合には外光が強い場所では外光の反射によって画像表示が見えにくくなってしまい、反射型表示装置の場合には外光が弱い場所では画像表示が見えにくくなるという問題があった。
【０００７】さらに、上述のような表示装置は、その用途に応じて様々な個所に配置されるが、乗り物（例えば、電車、バス等）や建物（例えば、店舗等）などの窓部に配置するニーズも考えられる。かかる場合に、表示装置が画像表示に供されるだけで光を透過しない場合には、内部から外部の景色が見えなくなったり、外部からの光が内部に入らなかったり（つまり、窓部本来の機能が損なわれたり）して問題があった。例えば反射型表示装置の場合は、光を透過させない反射板があるためにそ

のような問題が生じ、透過型表示装置の場合は、液晶パネル等の表示素子自体は光透過型であるがバックライト装置等が光を遮るためにそのような問題を生じさせていた。

【0008】そこで、本発明は、消費電力の増加を防止する表示装置を提供することを目的とするものである。

【0009】また、本発明は、画像表示の品質劣化を防止する表示装置を提供することを目的とするものである。

【0010】

【課題を解決するための手段】本発明は上記事情を考慮してなされたものであり、光のスイッチングを行う透過型表示素子、を備えた表示装置において、光透過状態と光反射状態とを選択的に現出できる調光素子が、前記表示素子に沿うように配置された、ことを特徴とする。

【0011】また、本発明は、光のスイッチングを行う透過型表示素子と、該表示素子に沿うように配置されて光透過状態と光反射状態とを選択的に現出できる調光素子と、を備えた表示装置の駆動方法であって、前記調光素子を光透過状態とした場合に、該調光素子を透過してくる光を利用して前記透過型表示素子によって画像表示を行ない、かつ、前記調光素子を光反射状態とした場合に、前記表示素子に照射される光を利用して画像表示を行う、ことを特徴とする。

【0012】

【発明の実施の形態】以下、図1乃至図4を参照して、本発明の実施の形態について説明する。

【0013】本実施の形態に係る表示装置は、図1に符号D_1で示すように、光のスイッチングを行う透過型表示素子P_1と、該表示素子P_1に沿うように配置されて光透過状態と光反射状態とを選択的に現出できる調光素子A_1と、によって構成されている。

【0014】ここで、図1は1つの画素の断面構造を示したものであるが、前記透過型表示素子P_1は複数の画素を有するようにすれば良い。そして、前記透過型表示素子P_1による光のスイッチングは画素単位で独立に行うことによって画像を表示させれば良く、前記調光素子A_1による光透過状態や光反射状態の現出は、複数の画素に対して同様に行うようにすると良い。すなわち、前記調光素子A_1を光透過状態とした場合には（図1(a)参照）表示素子P_1の複数の画素に同様に光が照射されるようにし、前記調光素子A_1を光反射状態とした場合には（図2(a)参照）表示素子P_1の複数の画素を透過してきた光が同様に反射されるようにすると良い。なお、前記調光素子A_1による光透過状態や光反射状態の現出は、画素のほぼ全面に亘って行うようにしても良いが（図3(a)（b）参照）、表示素子の一部、すなわち各画素の一部について行う（図4参照）ようにしても良い。

【0015】そして、前記調光素子A_1を光透過状態とした場合には、該調光素子A_1を透過してくる光を利用して前記透過型表示素子P_1によって画像表示を行ない（図1(a)（b）参照）、前記調光素子A_1を光反射状態とした場合には、前記表示素子P_1に照射される光を利用して画像表示を行うようになっている（図2(a)（b）参照）。また、調光素子A_1並びに表示素子P_1の両方を光透過状態にすることに基づき、画像表示はなされないものの、光透過状態を現出できる（図1(a)参照）。

【0016】ここで、透過型表示素子P_1は、所定間隙を開けた状態に配置された一対の透明基板1，2と、これらの透明基板1，2の間に配置されて光のスイッチングを行うスイッチング層3と、該スイッチング層3に沿うように配置された電極4a，4bと、によって構成されている。なお、図1及び図2では、スイッチング層3としては、光透過性の絶縁性液体5に着色帯電粒子6を分散させたものを示す（すなわち、表示素子を電気泳動素子とした例を示す）が、ゲストーホスト型やツイストネマチック（TN）型等の液晶を用いても良く（すなわち、表示素子を液晶素子としても良く）、高分子材料と液晶との混合物である高分子分散型液晶を用いても（すなわち、表示素子を高分子分散型液晶素子としても）良い。液晶素子としては、第2529184号特許公報に開示されている透過型液晶素子や、第2921356号特許公報や第2998075号特許公報や特開平6－337421号公報に開示されているような反射型液晶素子を用いると良く、電気泳動素子としては、特開平8－179704号公報（フジクラ）や特開平9－211499号公報(東芝)に開示されているものを用いれば良い。

【0017】また、調光素子A_1は、所定間隙を開けた状態に配置された一対の透明基板2，10と、これらの透明基板2，10の間に配置されて光の透過及び反射を選択的に行う調光層11と、該調光層11に沿うように配置された電極12a，12bと、によって構成されている。ここで、調光層11としては、スイッチング層3と同様、液晶を用いても良く（すなわち、調光素子を透過型液晶素子としても良く）、高分子材料と液晶との混合物である高分子分散型液晶を用いても良く（すなわち、調光素子を高分子分散型液晶素子としても良く）、光透過性の絶縁性液体に着色帯電粒子を分散させたものとしても（すなわち、調光素子を電気泳動素子としても）良い。なお、液晶としては、高分子分散型が一般的であるが、電圧を印加することにより、配向ベクトルに平行な誘電率と垂直な誘電率の差$\Delta\varepsilon$の値を正から負または負から正にすることによって、その表示を切り替えることのできる液晶材料であれば特に限定されることなく、ネマチック液晶、スメクチック液晶、コレステリック液晶等いずれを用いることもできる。透過率は透明状態で80％以上、散乱状態で10％以下が好ましい。

【0018】なお、図1では、調光素子A_1は透過型表

示素子P_1の外部（すなわち、符号４ｂで示す電極の下側）に配置されているが、もちろんこれに限られるものではなく、透過型表示素子P_1の内部（例えば、電極４ａ，４ｂの間）に配置しても良い。また、同図では、符号２で示す透明基板が、表示素子P_1及び調光素子A_1の両方の構成部品を兼用しているが、もちろんこれに限られるものではなく、別々の透明基板を用いても良い。

【００１９】ところで、上述した透過型表示素子P_1は、図１では調光素子A_1に沿うように１つだけ配置されているが、図３及び図４に示すように、調光素子A_1，A_2の両側に１つずつ配置しても良い。

【００２０】次に、本実施の形態の作用（表示装置の駆動方法）並びに効果について説明する。

【００２１】いま、調光素子A_1を光反射状態とした場合、表示素子P_1は光反射型の画像表示を行うことができ（図２(a)（b）参照）、調光素子A_1を光透過状態とした場合には表示素子P_1は光透過型の画像表示を行うことができる（図１(a)（b)参照）。なお、光反射型及び光透過型のいずれの画像表示を行うかは、表示装置D_1の表裏の光量を比較した上で決定すれば良く、いずれの場合にもバックライト装置を不要として消費電力を低減することができる。しかも、外光が強い場所では光反射型の表示を行い、外光が弱い場所では光透過型の表示を行うことによって、外光の強弱にかかわらず画像表示を明瞭にすることができる。

【００２２】また、調光素子A_1及び表示素子P_1の両方を光透過状態とした場合には（図１(a) 参照）、表示装置D_1の裏側を視認することができる。したがって、該表示装置の設置個所を、乗り物（例えば、電車、バス等）や建物（例えば、店舗等）などの窓部にした場合には、必要に応じて画像表示を行い、或いは（表示装置自体を取り外したりしなくても簡単な操作で）窓部本来の機能を取り戻して内外の視認性を確保（例えば、乗り物内部や建物内部の採光性を確保）することができる。なお、乗り物や建物内部の光源を利用した場合には、それらの外部に対して光透過型の画像表示を行うことができる。

【００２３】さらに、図３に示すように調光素子A_1の両側にそれぞれ表示素子P_1を設けた場合には、それらの表示素子P_1を利用した両面表示を独立に行うことができる。

【００２４】またさらに、図４に示すように、前記調光素子A_1による光透過状態及び光反射状態の現出を前記表示素子P_1の一部について行うようにした場合には、画像表示及び視認性の確保（乗り物や建物の内外の視認性の確保）の両方を同時に達成することができる。

【００２５】

【実施例】以下、実施例に沿って本発明を更に詳細に説明する。

【００２６】（実施例１）本実施例においては、図１に示す表示装置D_1を図５に示す方法で作製した。

【００２７】すなわち、絶縁層としての１００μｍ厚のPETフィルム８ａに炭化チタン膜を成膜し、該膜をフォトリソグラフィー及びドライエッチングによりライン状にパターニングして電極４ａを形成した（図５(a) 参照）。なお、電極４ａの線幅は５０μｍとした。次に、この電極４ａを覆うように、絶縁層としての透明ポリイミド層８ｂを形成し（同図(b) 参照）、PETフィルム８ａの裏面（図に示す下面）にはITO（インジウム・ティン・オキサイド）を成膜し、ライン状にパターニングして電極４ｂを形成した（同図(c) 参照）。

【００２８】そして、透明ポリイミド層８ｂの上面には、高さが５０μｍの隔壁７を光感光性樹脂によって形成し（同図(d) 参照）、該隔壁７の上面には光透過性の接着剤を塗布して基板１を接着した。そして、隔壁７の内部には、絶縁性液体としてのアイソパーＨ（エクソン社製）５と、着色帯電粒子６とを注入した（同図(e) 参照）。なお、着色帯電粒子６としては、ポリスチレンとカーボンの混合粒子で、１～３μｍ程度の大きさのものを用いた。

【００２９】次に、特開平０５－０６１０２３号公報に記載されている方法で透過/散乱部（調光素子）A_1を作製した。すなわち、図６に詳示するように、ＩＴＯ透明電極１２ａ，１２ｂや絶縁層１４ａ，１４ｂを形成した一対の透明基板２，１０を、スペーサー１３を挟み込むようにして１０μｍのセルギャップで張り合わせ、その基板間隙には所定の混合溶液（すなわち、重合性モノマーの２－エチルヘキシルアクリレートと重合性オリゴマーＰＥ９０００（根上工業（株）製）と二周波駆動液晶ＮＲ－１０１２ＸＸ（チッソ（株）製）と重合開始剤ベンゾフェノンの混合溶液）を注入し、該混合溶液は紫外線照射によって硬化させて液晶高分子複合層からなる透過／散乱層（調光層）１１とした。

【００３０】そして、上述のようにして作製した表示部P_1と透過／散乱層部A_1とを光透過性の樹脂で張り合わせ、表示装置D_1を作製した。

【００３１】いま、透過／散乱層１１を散乱状態とした上で、電極４ａに－５０Ｖの電圧を印加すると、正極性に帯電している着色帯電粒子６は該電極４ａに引き付けられて集まり（図２(a) 参照）、観察者は透過／散乱層１１の色（白色）を視認する。この状態で、電極４ａ，４ｂへの電圧印加を休止しても、白表示状態は維持された。また、電極４ｂに－５０Ｖの電圧を印加した場合には、正極性に帯電している着色帯電粒子６は電極４ｂに引き付けられて集まり（図２(b) 参照）、観察者は着色帯電粒子６の色を視認することとなる。この場合の応答速度は３０msec以下であり、表示ムラは観察されなかった。

【００３２】次に、透過／散乱層１１を透明状態とした上で、電極４ａに－５０Ｖの電圧を印加すると、正極性

に帯電している着色帯電粒子６は該電極４ａに引き付けられて集まるため（図１(a) 参照）、観察者は表示装置D_1を透過した景色を視認することとなる。

【００３３】（実施例２）本実施例においては、絶縁性液体５としてシリコーンオイルを使用し、着色帯電粒子６としては、ポリエチレンとイエロー、シアン、マゼンダの着色顔料からなる粒径１～２μｍの着色粒子を使用した。また、透過／散乱層部A_1を作製する際における混合溶液の硬化は、紫外線照射と加熱とを併用して行った。その他の構成及び製造方法は実施例１と同じにした。

【００３４】いま、透過／散乱層１１を散乱状態とした上で、電極４ａに－５０Ｖの電圧を印加すると、正極性に帯電している着色帯電粒子６は該電極４ａに引き付けられて集まり（図２(a) 参照）、観察者は透過／散乱層１１にて反射された光を視認して白表示を認識することとなる。この状態で、電極４ａ，４ｂへの電圧印加を休止しても、白表示状態は維持された。また、電極４ｂに－５０Ｖの電圧を印加した場合には、正極性に帯電している着色帯電粒子６は電極４ｂに引き付けられて集まり（図２(b) 参照）、観察者は着色帯電粒子６にて反射された光を視認することとなる。この場合の応答速度は３０msec以下であり、表示ムラは観察されなかった。

【００３５】次に、透過／散乱層１１への電圧印加を休止すると、表示装置D_1は全面にわたって透明状態となり、観察者は表示装置D_1を透過した景色を視認することとなる。

【００３６】（実施例３）本実施例においては、図３に示す両面表示装置D_2を作製した。この表示装置D_2は、透過／散乱層部（調光素子）A_1の表裏に光透過性接着剤によって一対の表示部（透過型表示素子）P_1を張り合わせて作製した。なお、表示部P_1には、実施例１にて作製したと同様のものを用い、透過／散乱層部A_1には、実施例２にて作製したと同様のものを用いた。

【００３７】いま、透過／散乱層１１を白濁させた状態で各表示部P_1を駆動すると、両面において画像表示を視認することができた（図３(a) 参照）。

【００３８】また、透過／散乱層１１の電極に５０Ｖの電圧を印加して透過状態にすると共に、表示部P_1の駆動を図１(a) に示すようにすると、図３(b) に示すように、表示装置を光が透過する。

【００３９】（実施例４）本実施例においては、図７に示す表示装置D_4を作製した。すなわち、特開平０６－３３７４２１号公報に開示されている反射型液晶表示素子を表示部P_2として用い、透過／散乱層部（調光素子）A_1には、実施例２にて作製したと同様のものを用いた。そして、これらの表示部P_2と透過／散乱層部A_1とを光透過性接着剤で接着することで透過型表示と反射型表示の両方ができる透過反射型複合型表示装置D_4を作製した。

【００４０】具体的には、電極表面に配向膜処理した透明電極をもつガラス板でゲスト－ホスト型等の液晶物質を狭持し、表示面に偏光板を備えた液晶表示素子を表示部P_2として用いた。また、表示装置の表面側及び裏面側には、光量が検知できるような素子（不図示）をそれぞれ配置した。

【００４１】このようにして作製した表示装置を、図７(a) 及び(b) に示すように建物の窓ガラス２０に接着し、表示部P_2を１４８０デューティで駆動し表示を行った。

【００４２】透過／散乱層部A_1を透明状態としてその透過光量L_2を測定したところ、屋外の光L_1の３～４割程度になることが分かり、日中で屋外が明るい場合には、屋外からの光（自然光）L_2をバックライトとして利用して表示装置による画像表示が可能であることが確認できた(図７(a) 参照）。

【００４３】なお、夜間等、屋外が暗くて屋内が明るいような場合には、透過／散乱層部A_1を散乱状態とすることで表示装置を反射型として画像表示を行うことができる（図７(b) 参照）。

【００４４】また、図８に示すように、透過／散乱層部A_1を透明状態とし、表示部P_2にて画像表示を行った場合、屋内の照明光（透過光）L_3を利用することによる画像表示が可能であった。

【００４５】（実施例５）本実施例においては、図４に示すように、実施例３とほぼ同様の両面表示装置D_3を作製した。但し、透過/散乱層部（調光素子）A_2においてＩＴＯ透明電極（図６の符号１２ａ，１２ｂ参照）は部分的にのみ形成し、白濁状態を部分的に現出するようにした。その他の構成や製造方法は実施例３と同じにした。

【００４６】いま、透過／散乱層１１を白濁させた状態で各表示部P_1を駆動すると、該白濁された部分では両面において画像表示を視認することができ、白濁された部分以外では透明状態を現出できた（図４参照）。

【００４７】また、透過／散乱層A_2を透過状態にすると、表示部P_2の全体において透過状態を現出できた。

【００４８】

【発明の効果】以上説明したように、本発明によると、調光素子を光反射状態とした場合、表示素子は光反射型の画像表示を行うことができ、調光素子を光透過状態とした場合には表示素子は光透過型の画像表示を行うことができる。いずれの場合にもバックライト装置を不要として消費電力を低減することができる。しかも、外光が強い場所では光反射型の表示を行い、外光が弱い場所では光透過型の表示を行うことによって、外光の強弱にかかわらず画像表示を明瞭にすることができる。

【００４９】また、調光素子及び表示素子の両方を光透過状態とした場合には、表示装置の裏側を視認すること

ができる。したがって、該表示装置の設置個所を、乗り物（例えば、電車、バス等）や建物（例えば、店舗等）などの窓部にした場合には、必要に応じて画像表示を行い、或いは（表示装置自体を取り外したりしなくても簡単な操作で）窓部本来の機能を取り戻して内外の視認性を確保（例えば、乗り物内部や建物内部の採光性を確保）することができる。なお、乗り物や建物内部の光源を利用した場合には、それらの外部に対して光透過型の画像表示を行うことができる。

【００５０】さらに、調光素子の両側にそれぞれ表示素子を設けた場合には、それらの表示素子を利用した両面表示を独立に行うことができる。

【００５１】またさらに、前記調光素子による光透過状態及び光反射状態の現出を前記表示素子の一部について行うようにした場合には、画像表示及び視認性の確保（乗り物や建物の内外の視認性の確保）の両方を同時に達成することができる。

【図面の簡単な説明】

【図１】本発明に係る表示装置の構造の一例（一画素部分）を示す断面図であって、調光素子が光透過状態の場合の様子を示す図。

【図２】本発明に係る表示装置の構造の一例（一画素部分）を示す断面図であって、調光素子が光反射状態の場合の様子を示す図。

【図３】本発明に係る表示装置の構造の一例（一画素部分）を示す断面図。

【図４】本発明に係る表示装置の構造の一例（一画素部分）を示す断面図。

【図５】表示素子の製造方法を示す図。

【図６】透過／散乱部の詳細構造を示す図。

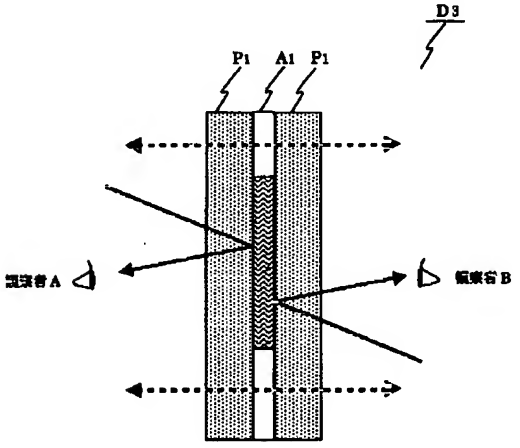
【図７】本発明に係る表示装置の構造の一例を示す断面図。

【図８】本発明に係る表示装置の構造の一例を示す断面図。

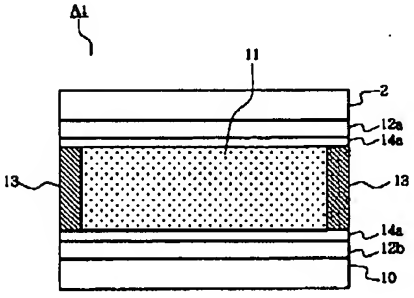
【符号の説明】

1	透明基板
2	透明基板
3	スイッチング層
4a，4b	電極
5	シリコーンオイル（絶縁性液体）
6	着色帯電粒子
10	透明基板
11	透過／散乱層（調光層）
12a，12b	電極
A_1	透過／散乱層部（調光素子）
D_1	表示装置
D_2	表示装置
D_3	表示装置
D_4	表示装置
P_1	表示部（透過型表示素子）
P_2	表示部（透過型表示素子）

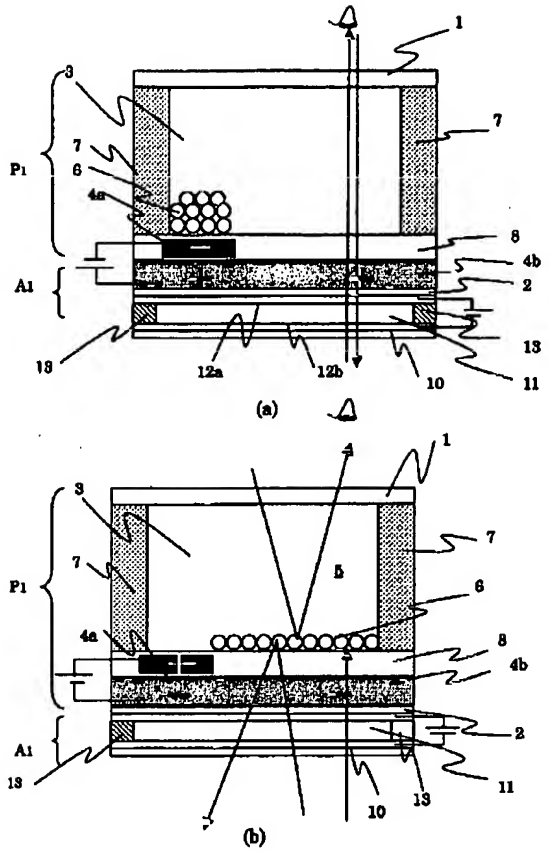
【図４】



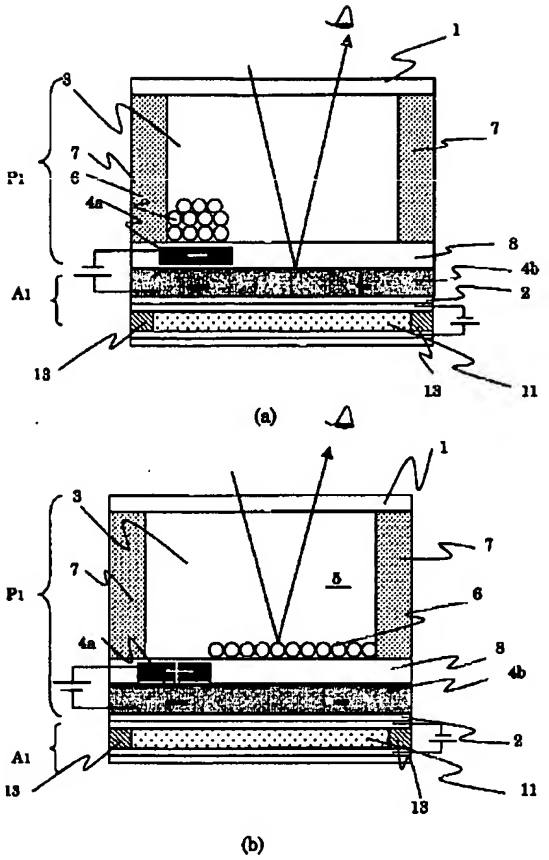
【図６】



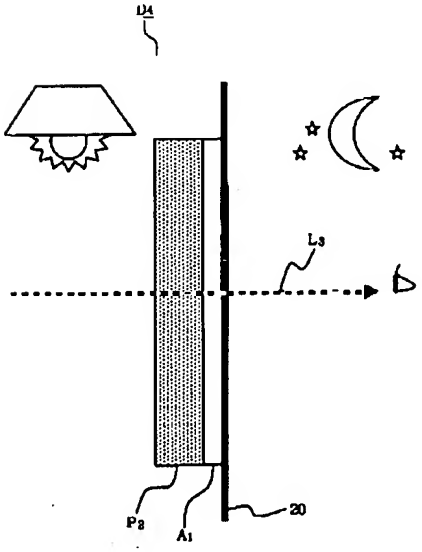
【図1】


1
3
7
P1
6
4a
8
4b
A1
2
13
12a
12b
10
11
(a)
5
(b)

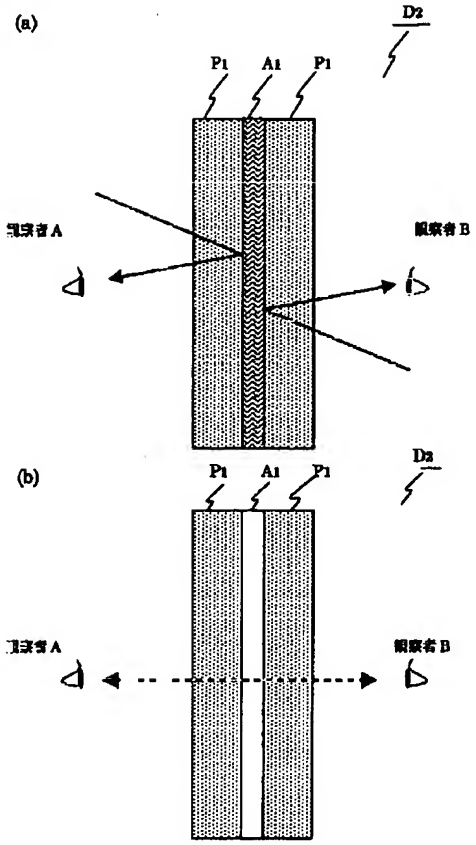
【図2】


1
3
7
P1
6
4a
8
4b
A1
2
13
11
(a)
5
(b)

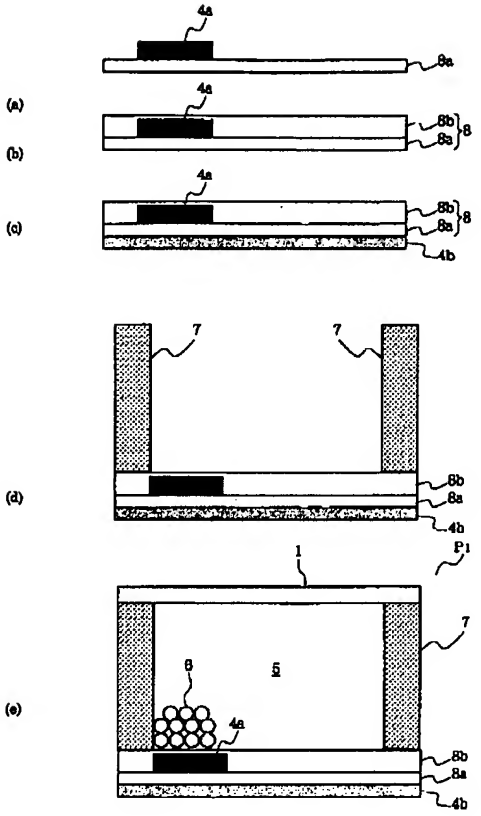
【図8】


D4
L3
P3
A1
20

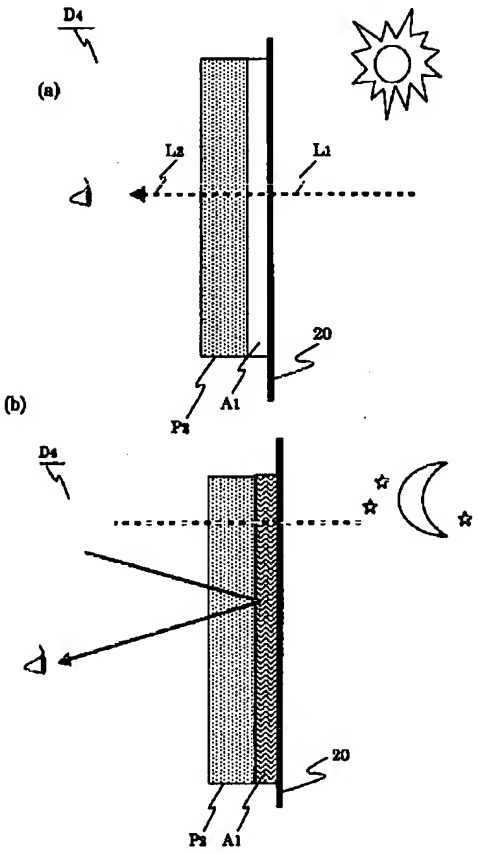
【図3】


(a)
D2
P1
A1
P1
観察者A
観察者B
(b)
D2
P1
A1
P1
観察者A
観察者B

【図5】


(a)
4a
8a
(b)
4a
8b
8a
8
(c)
4a
8b
8a
8
4b
(d)
7
7
8b
8a
4b
(e)
1
P1
7
6
5
4a
8b
8a
4b

【図7】



フロントページの続き

(51)Int.Cl.[7]	識別記号	FI		(参考)
G09F 9/37		G09F 9/37	Z	

Fターム(参考) 2H089 HA04 HA33 JA04 KA08 QA16
RA04 RA05 RA11 RA13
2H091 FA16Z FD06 FD23 HA06
HA07 HA11 JA02 LA16 LA30
2H093 NA01 ND02 ND60 NE06 NF04
NF05 NF06 NF11
5C094 AA01 AA51 AA56 BA43 BA44
BA47 BA74 BA75 BA84 CA23
ED20 GA10 HA05